ALLAHABAD AGRICULTURAL INSTITUTE

Department of Agricultural Economics and Rural Sociology

CERTIFICATE OF ORIGINAL WORK

This is to certify that Tusar Kanti Ghosh of the University of Allahabad, planned his study, carried out the survey work, analysed the data and prepared this report on "A COMPARATIVE STUDY ON ECONOMICS OF HIGH YIELDING VARIETIES AND LOCAL VARIETIES OF PADDY IN CHAKA BLOCK, ALLAHABAD, U.P."

These he did in part fulfilment of the requirements of the Master of Science in Agricultural Economics degree of the University of Allahabad.

A. C. Broadway
M.A., M.Sc., M.A.(Econ)
Senior Lecturer
Department of Agricultural
Economics & Rural Sociology
Allahabad Agricultural Institute,
Allahabad.

CERTIFICATE OF CHAIRMAN
Department of Agrl. Economics & Rural Sociology
AND

MEMBER OF THE EXAMINATION COMMITTEE

This thesis attached hereto, entitled "A COMPARATIVE STUDY OF ECONOMICS OF HIGH YIELDING VARIETY AND LOCAL VARIETY OF PADDY IN CHAKA BLOCK, ALLAHABAD, U.P." is prepared and submitted by Tusar Kanti Ghosh, in part fulfilment of the requirements for the degree of Master of Science in Agricultural Economics is hereby accepted.

Member
Examination Committee

Designation & Address

Date:

Chairman
Examination Committee
[illegible]

Designation & Address
[illegible]
[illegible]

Date:
15.6.[illegible]

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Tusar Kanti Ghosh.

Date: Tusar Kanti Ghosh

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LIST OF TABLES

Table No.	Title	Page No.
IV.1	Structure of Farm Families	21
IV.2	Literacy of sample farmers	21
IV.3	Occupational distribution of sample farmers	22
IV.4	Land Utilisation of sample farmers	23
IV.5	Source wise distribution of irrigated area of sample farmers	24
IV.6	Cropping pattern	24
IV.7	Cost of cultivation of High Yielding and Desi varieties of paddy (per hectare)	25
IV.8	Cost of cultivation per hectare for High Yielding varieties of paddy	27
IV.9	Pattern of resources use per hectare for High Yielding Varieties and Desi varieties.	28

LIBRARY

Table No.	Title	Page No
IV.10	Pattern of resources use of H.Y.V. according to different varieties	29
IV.11	Cost of multivation per hectare for local varieties of paddy	30
IV. 12	Crop cum-variety wise yield net profit and and input-output ratio on sample farms	32
IV.13	Cost of cultivation of H.Y.V. under first size group	33
IV. 14	Cost of cultivation of H.Y.V. under second size group.	34
IV.15	Cost of cultivation of H.Y.V. under third size group	35

CHAPTER I

INTRODUCTION

The Indian High Yielding Varieties programme, an action programme based on new technology was incorporated in the Fourth Five Year Plan and implemented in 1966-67 (in an emergency situation created by two successive droughts) with a view to achieving self sufficiency in food grains and improving the rural income. The Government of India earlier has launched several programmes[1] have had different objectives and approach. The emergency situation resulting from two major successive droughts years (1965-66 and 1966-67) necessiated the urgency of some short cut method which could give quick yielding results so as to meet the critical food shortage. The High Yielding Varieties technology essentially requires greater inputs as also their co-ordination with precision but offers higher effects productivity in short time. As a result of channelisation of efforts of the Government of India, the agricultural output and productivity per acre have respectively increased at a compound rate of 3.0 and 1.4 percent per year during 1949-50.

The emphasis, therefore, had to be placed on principle of selectivity in area and intensification of cultivation so as to concentrate efforts and investments to

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[1] A strategy for agricultural planning 1966 - Page 30
National Council of Applied Economic Research - Page 20

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ensure quick returns. The Government of India followed the recommendation of the Ford Foundation Team.[2]

The Intensive Agricultural District Programme popularly known as "Package Programme" in 1961-62 was launched by the Government of India. In subsequent years Intensive Agricultural Area Programme (IAAP) was inoperation These programmes were concerned with intensive agriculture in the areas favoured with maximum irrigation potentiality and minimum natural hazards. Demonstration of improved practice supply of inputs of seeds, fertilisers, pesticides, credit and implements were taken up by the Government for increasing the cropping intensity. However, achievement statistics were dissapointing. It was realised that though the programme were concerned with intensive agriculture they operated within the limitation set by existing crop varieties which have relatively low responsive to fertilizers. By this time, some new dwarf and short duration crops which are highly responsive to fertilisers were available as a result of research in the science of plant breeding sponsored by Rockfeller in the Phillippines and Mexico. Besides rapid changes at that time were taking place in the varietal position of the country and institutions like Central Rice Research Institute, Cuttack and at Hyderabad were busy in developing varieties to suit the varied ago climatic condition of India.[3]

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[2] Strategy for Agricultural Planning 1966, New Delhi. Page 45

[3] Report on "India's food crisis and steps to meet it" April 1959 sponsored by the Ford Foundation.

High Yielding Variety Programme:

In recognisation of the need for the development of agriculture, this new strategy viz., High Yielding Varieties Programme was introduced in the country from kharif of 1966-67 and covered paddy, wheat and millets. It was started with the objective of introducing newly identified High yielding strains responsive to high doses of fertilizers. The programme was aimed at attaining self sufficiency in food by the end of 1970-71. The introduction of this High Yielding Variety Programme in 1966 is an additional feather on its cap as it had done a commendable work in implementing this very successfully. This was seen from rapid increase in the number of participants in the programme within a short period of three years. Name of high yielding varieties which are being grown now a days are as follows: Padma, Jaya, Krishna, Vijaya, Jamuna Sabarmati, I.R. 20, I.R. 8, Taichung Native I etc. For increasing agricultural production to meet the requirements of the over increasing population of India, the suitable strategy is to increase the production per unit area and per unit time. This isonly possible by making use of High Yielding Varieties of crops and intensity of cropping. It depends upon the use of balanced fertilizers and adequate irrigation.

In the fourth plan, the H.Y.V.P is of crucial importance. Nearly two third of additional production of food grains is expected by the extension of this programme from the base level of 8.5 million hectares to 24.1 million hectares.

The High Yielding Varieties Programme was planned to be organised and administered by both Union and State Department of Agriculture.

The main elements are :

1) To make available the required type and quantity of inputs, particularly chemical fertilizers and to allocate sufficient foreign exchange for this purpose.

2) To encourage investment in fertilizer factories and to allocate sufficient foreign exchange for this purpose.

3) To recognise agricultural research into a co-ordinated programme of all India scheme aimed to raise Indian agricultural productivity.

4) To provide adequate credit to farmers willing to grow the new varieties and adopt new farm practices and

5) To emplement cereal price levels which would be "producer oriented" i.e. would provide economic incentives to farmers to inwest in the fertilizer seed and other inputs required for new technology.[4]

Problem

Although H.Y.V.P. was launched there was lot of difficulties faced by the farmer regarding climatic conditions. At these particular varieties of high yield are very highly suceptible to disease, pests. The recommended doses of fertilizer are not being practised by the farmers because they are

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[4] H.Y.V.P. Fourth Plan Draft Outline
Food grain production in Third Five Year Plan.

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unable to pay such amount. Neither they are able to buy recommended pesticides. Scarcity and high prices of inputs have hindered farmers even to apply the recommended doses of fertilizers, pesticides etc. Water supply position is also not adequate because required irrigation facilities are not existing. Again the importance of credit supply is also a big issue because most of the farmers are not able to pay the over-head costs involved in such cultivation, easy access to credit is very necessary for purchase of bullocks, sprayers, fertilisers and pesticides.

Justification:

It is indicated there is no simple answer to break through in rice production. Pin pointing the obstacles to increase rice yields at the local or farm level is a priority. The co-operative state and central research work of the all India co-ordinated rice improvement programme is evolving promising new high yielding varieties and other technology.

Since there was acute shortage of food grains in the country and frequent draughts, a vigorous effort has been made to fulfil the requirement of the country. The study also will reveal the cost needed for the H.Y.V. than the local variety, its profit ability which will be of greater importance to the farmer as well as the Government. The Government policy was to attain the highest production in the field of agriculture with the help of latest technology in agriculture. The study is justified in the above point of view. Farmers mostly practice local varieties either due to the shortage of inputs or due to lack of confidence. This study will help the farmers as far as the yield is concerned. The survey says that prices show a continuous tendency to rise inspite of the increase in the production of food grains. It plays an important role in the field of economic investigation specially in agricultural production accompanied by uncertainty in price yield and institutional factors including Government policies. It also plays an important role in the formulation of price policies by the Government as well as in the efficient use of resources.

One more economic implication of the high yielding varieties of the paddy crop is not only this yield heavily but also make it possible to the attainment of self sufficiency in food.

Objectives

The study was undertaken with the following objectives:

To analyse the impact of cultivation of high yielding varieties of paddy on the (a) Cropping pattern

(b) Pattern of resource use

(c) Farm income.

CHAPTER II

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REVIEW OF LITERATURE

In the year 1966-67, H.Y.V. programme was launched. Shingarey and R.K. Waghmare[1] sampled 40 cultivators from 16 villages of Kolaba district of Maharastra villages were selected because it was under Taichung Native I, a rice variety. The data says the yield is about 6 quintals per acre more grain and about ₨ 62 per acre additional net gain over the local variety grown by the same farmer. The authors estimate a Cobb Douglas type production function was filled, which related yield of T.N.I to land, human labour, bullock labour and working capital excluding expenditure on human and bullock labour. Only land and bullock labour had elasticities significantly different from zero.

T.R.K. Rao[2] studied the variety of I.R.8 in the west godavari district. His studies were as long as coverage and performance were concerned. 18 participants and 7 non participants were contacted of which participants were considered more educated than nonparticipants. The variety I.R. 8 on an average yielding about 58 percent more grain per acre and about 22 percent more net income. The author also noted that the cultivator devoted greater area (35 percent to I.R.8 than large cultivators (20 percent). This fact perhaps

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[1] Shingarey, M.K. Waghmare, " A study into economics of cultivation of Taichung Native I paddy in Kolaba district of Maharastra". Indian Journal of Agricultural Economics Bombay, Vol. xxiii No. 4, Oct-Dec 1968, pp 61-65.

[2] T. Ramkrishna "The performance of rice variety I.R.-8 in godavari district". Indian Journal of Agricultural Economics Bombay, Vo. xxiii, No. 4, Oct-Dec. 1968.

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perhaps contributes to the result that the expenditure on hired labour per acre is not very much higher than for I.R. 8 than for local variety.

M.D. Gopal Krishnan[3] studied the performance of A.D.T. 27 in the thanjaur district and contacted 50 cultivators from two villages. The introduction of high yielding strain ADT - 27 has raised the agricultural production on a massive scale. The decision of the farmers in the district is almost uniform to switch over to this high yielding strain as they get better economic returns from their farms as a whole.

The study "Response of some High Yielding Paddy variation to nitrogen; an economic analysis made by I. J. Singh and T.K. Chowdhury and Dinkar Rao[4] The study showed that I.R. 8 was highly responsive to higher levels of nitrogen application compared to Taiwan 3 and China - 4. The per hectare optimum doses of nitrogen application giving maximum production response to nitrogen were 180 Kgs, 100 Kgs and 80 Kgs, for I.R. 8, Taiwan 3 and China 4 respectively. The most profitable levels of nitrogen application for I.R. 8 , Taiwan - 3 and China -4

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[3] Gopal Krishna, M.D. "Productivity and profitability of A.D.T. 27 in thanjaur district, I.J.A.E, Bombay. Vol. xxiii, No. 4, Oct-Dec 1968 pp. 63-69.

[4] Singh, I.J. Chowdhury, T.K. and Rao Dinkar " Response of some H.Y.V.P. to nitrogen; An economic analysis" I.J.A.E. Bombay Vol. xxiii, No. 4 Oct-Dec, 1968 pp 69-71.

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were about 151 Kgs, 96 Kgs and 97 Kgs per hectare respectively. ₨ 729.81, ₨ 602.05 and ₨ 166.83 per hectare from I.R. 8, Taiwan 3 and China 4, showing the relative profitabilities of the varieties.

A sample village study conducted by Misra and Shukla shows that variation in management efficiency, improved seeds and cultural practices led differences in output rather than those in the use of input factors. For the village in question the authors suggest a number of steps towards improving general economic and social conditions which will be in turn lead to more efficient agriculture too. This study relates to village Chauhatra situated 9 K.M. away from Agra on the western side near Bichpuri Railway station. The study was undertaken to analyse resource utilisation under different scales of farming and on that basis improvements suggested. The list of agricultural households was prepared with the help of record. The operational holding was taken as the basis of selection taking into account the land leased in or leased out during the year. On the basis of their size of holding the households were classified into three categories:

1) Small farmers having area below 1 ha.
2) Medium farmers having 1 - 1.99 ha.
3) Large farmers having above 2 ha.

In the end authors conducted that even under the existing conditions of farming there was ample scope for

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raising farm production and farm income in the area as was evident from the differences observed in the performance and efficiency of resources towards the production of various crop enterprise within the same category of farm.[5]

In a study by Krishan and Mehrotra[6] they presented in a comparative setting a detailed review of how the different high yielding varieties of rice have flared in I.A.D.P. districts over the brief periods since their introduction bringing the outstanding role of these varieties in increasing food production. The fields selected for the sample crop cut harvest were fixed through a three stage random sampling design, with a village, a field and a plot respectively, as the first, the second and the ultimate sampling units. A cut of requisite size adopted for sample plot was carefully democrated, the produce in it was ascertained accurately by actual weightment. The present paper deals with the studies conducted on the data relating to high yielding varieties of rice collected through the cropcut survey in the I.A.D.P. districts.

They concluded that high yields of over 25 quintals of cleaned rice per hectare were obtained for high yielding varieties during 1967-68 in the district of Godavari, Mandya and Sambalpur. In all these districts fertiliser consumption for high yielding varieties were quite high. Majority of farmers of these district apply fertilizer in balanced form. In the central belt of the country fertiliser doses adopted to high yielding varieties were generally moderate and yield rates obtained were 20 quintals/ha or less. The lower performance of the new varieties in these central belt districts like Thanjaur, Shahabad, Jammu, etc. could be partly described to the lower rates of fertilizer use.

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[5] Misra J.P. and Shukla, B.D. "Economics of farming in Bichpuri Block (Agra)", Agricultural situation in India Bombay, Vol. XXV, No. 1, April 1970, pp. 13-17.

[6] Krishnan, K.S. and Mehrotra, P.C. "Performance of high yielding varieties of Rice in cultivation held in the I.A.D.P. districts - A Study "Agricultural Situation in India, Bombay Vol. XXV, No. 1, April 1970, pp. 447-478.

A study on the cost benefit ratio of high yielding variety of paddy in Orissa was studied by P.N. Das[7]. In the data collected in the Sambalpur district of Orissa where cultivation of high yielding variety of paddy had made good progress have been analysed to determine the cost and income level. It was estimated that fertilizer accounted for 63.09 percent of operational cost A_1, next in order of weightage was bullock labour 14.48 percent, hired human labour accounted for 12.57 percent whereas plant protection, seed and irrigation charges accounted for 4.88 percent, 2.96 percent and 1.73 percent of the operational cost A_1 respectively. Though yield rate of local paddy was lower in Orissa, estimates of income from the main product as well as by product of high yielding paddy provided a gross income of Rs 1,317 and a net income of Rs 912 per acre, accordingly the input and output ratio was 1:3:8

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[7] Das, P.N. "Cost Benefit Ratio of High Yielding paddy in Orissa. "Indian Journal of Agricultural Economics, Bombay, Vol. xxiii, No. 4, Oct-Dec. 1968, pp 139.

whereas cost benefit ratio was 1:3:4. This indicated that 20 percent deflation adopted at present for netting the gross domestic product in agriculture sector is low compared to the local variety and improved variety. is a much more efficient economic enterprise, but its high cost per acre which is higher than per capital income in States is a real constraint.

Chowdhury and Ghosh[8/] examined the performance and prospect of the H.Y.V.P. in the district of Birbhum and suggests measures for successful implementation of the progress. The study is based on the data collected by the agro-economic research centre, Vishwa Bharti, for kharif season 1967-68 from 60 participants and 40 non-participants farms scattered over 4 village in two blocks in the district of Birbhum. West Bangal. The total cost and total cash expenditure were much higher for the high yielding varieties of paddy than that of the local varieties. But the diesapointing feature was that the surplus of output over total cost and total cash expenditure was higher for the ordinary variety than the high yielding varieties of paddy. I.R. 8 variety of paddy, however, showed the best result yielding a profit per acre of Rs 573 as compared to Rs 320 and Rs 372 for the total high yielding varieties of paddy and ordinary varieties respectively. Thus even in the present circumstances I.R. 8 variety of paddy holds the key to success of the programme in the district of Birbhum.

[8/] Chowdhury, B.K. and Ghosh, M.G. "High Yielding Varieties Programme in Birbhum, West Bengal. Its Achievement and Prospect". Indian Journal of Agricultural Economics" Bombay, Vol. xxiii, No. 4, Oct-Dec., 1968 pp 140-141.

Narottam[9] conducted study regarding the influence of crop environment on the yield rate of Taichung. In view of the importance of yield studies, the cases of three cultivators selected from the Balasore and Mayurbharj districts of Orissa have been taken upto observe the extent of change in the yield rate of high yielding variety of paddy.

Taichung Native I, under different crop environments as far as possible, only the manuring techniques which the cultivators have applied in different periods of cultivation and the yield received have been considered. That the variation in the yield rate is partially due to certain crop environments like weather and pest attacks can be verified when these different crop environment faced by the farmers are taken accounts of. Assuming that there is no defect in the manuring techniques though such an assumption is a big one, it is observed that the uncontrolable crop environments ranging between 20 percent and 76 percent.

B. Das[10] in study kharif paddy for a sample of plots in the I.A.D.P. district of Sambhalpur district in Orissa discussed the exponents of the various factors

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[9] Nanda, Narottam, "Influence of Crop environment on the yield rate of Taichung" , Indian Journal Agricultural Economics, Bombay, Vol, xxiii, No. 4, Oct-Dec. 1968, pp. 141-142.

[10] Dasm B, "Resource productivity of a sample of farms in Sambalpur District in oridda." Indian Journal of Agricultural Economics, Bombay, Vil. xxiii, No. 4 Oct-Dec, 1968. pp. 142.

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of input. The values of these exponents some times conflict with the general concept. However, the high values of elasticity for fertilizers in both the equations indicates the importance of role of fertilizers in the production programme of both the varieties i.e. high yielding and the local variety.

Subramaniam[11] compared the economic cultivation of the high yielding variety A.D.T. 27 with a local variety and found out the resource efficiency of the factors used. This study is based on data collected from 43 participants and 10 nonparticipants in the high yielding variety programme in the Thiruvaiyaru Block of Thanjaur district A.D.T. 27 gave the very good yield than local variety.

J.V.L. Prasad and Dr. N. Srivastava[12] have done a study about High Yielding varieties programme of paddy in Palaghat, Kerala and West Godavari, Andhra Pradesh. It has been shown that the returns were multiplied and the yields increased. Resource returns were calculated for all the inputs except fertilizers, increased two-fold, while for fertilizer they were low in West Godavari. This must, draw the attention of the agriculture researcher for a revision of their fertilisers recommendation.

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[11] Subramaniam, S.P. "Research efficiency of high yielding variety of farmers". Indian journal of Agricultural Economics, Bombay, Vol. xxiii.,No. 4, Oct-Dec. 1968 Oct-Dec. 1968 pp 142-143

[12] Prasad, J.V.L. and Dr. Srivastava. N. "Economy of High Yielding Varieties." A spatial study Agricultural and Agro Industrial Journal, Vol. 3, March-April 1970, pp. 13-16.

The performance in West Godavari to poor. The farmer is not much benefited. However, cost apportionment was inadequate, for family labour and capital employed. However the study may draw attention of the policy makers to enhance the purchase price. In short, the conclusions are :

1. The palaghat farmers are benefited more than west Godavari farmers by cultivating High yielding paddy varieties.
2. Returns to unity cost of production and unit cost of resource used are more in palaghat district than west Godawari.
3. There is a need to increase the purchase price for paddy in Andhra in order to augment farmers out turn and to increase his attention in cultivating high yielding varieties.

Yield variability was lower in all those districts with a larger area and assured irrigation in comparison to those area which is less but with assured irrigation. This has been studied by Gangwar and George.[13] . This also reduces price variability and thereby stabilises the income. It also should more stability in income in regions provided with irrigation facilities.

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[13] Gangawar, A.C. and George, M.V. "Incoem, price and yield variability for principal crops and cropping pattern in Haryana State." Agricultural situation in India. May 1971. pp. 71-74.

It is seen that the population concentration is higher in rice growing areas and also the proportions of landless labourers and small farmers. 80 percent of gross rice area of the country are located to the southern and eastern States of the country flanked by U.P. and M.P.

P.P. Pillai[14] found it very contradidtory that irrigated paddy farms may yield about the thrice the quantity than the unirrigated paddy farm. But some further emperical study say that the marginal productivity of irrigated land si about 2½ times that of unirrigated land. Although the present study is insufficient to draw such inference but it may be useful for rough estimate.

Improved technology and high yielding varieties of crops offer a great potential for increasing agricultural production. But the bulk of the cropped area continued to be under the existing technology, 80 Kgs of C.A.N and 40 KG. of superphosphate permitted improved technology over 4444000 acres white existing technology contimued over 51.75 percent of the total cropped area.[15]

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[14] Pillai, P.P. "Towards a planning yard-stick for irrigation of rice in Kerala" Agricultural situation in India, Vo. xxiv, No. 1, April 1969, pp. 207-208.

[15] Mann, K.S. "Scope for adoption of High Yielding varieties and improved technology in Punjab Agriculture".Agricultural situation in India, Vol. xxiii, No. 1, April 1968 pp. 3 - 9.

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A study was conducted by Patil and Tambad[16] which reveals that about 80 percent of the farmer have manured their fields although there is no good response to higher doses of manure used which may due to the poor quality of the manures. Use of higher units of labour has resulted in higher yields compared to the average yields of those using lower units of labour indicating a positive response to the application of labour.

Pandey[17] conducted a study on the high yielding paddy crops in Varanasi district. Farms were selected and classified in three groups. The objective was to compare the economics of production of high yielding and local varieties of paddy. It revealed that the average inputs cost of H.Y.V. was higher than local variety and showed a decreasing trend with increasing size of farm.[1]

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[16] Patil, N.P. and Tambad, B.B. "Factors influencing productivity in paddy, Madhya Pradesh District (Mysore) Agri. Situation in India, Vol. xx No. 10, Jan. 1966. pp. 803-807.

[17] Pandey, H.K. "High Yielding Paddy crop in Varanasi District". Khadi Gram Udyog, Bombay - 56, Vol. xviii, No. 4, January 1972, pp. 267-270.

24684

CHAPTER III

METHODS AND MATERIALS

Nature and Scope of the enquiry:-

The present enquiry "Economics of high yielding varieties of paddy in Chaka Block of Allahabad district. In all 49 farm families were studied in five villages.

Selection of sample:- The selection of Chaka Block was made by the method of purposive sampling because the area falls under the jurisdiction of extension activities of Allahabad Agricultural Institute.

Selection of villages:- The list of all the villages in Chaka block was obtained from block office. The villages were then arranged in ascending order of their cultivated area under paddy. Those villages were taken into consideration which are having more than 50% area under paddy cultivation and then 5 villages were randomly selected.

Name of the village	Cultivated area (ha)
1. Badalgunj	104
2. Sarangapur	150
3. Palpur	160
4. Balipur	200
5. Chakapurkala	232

Selection of cultivators:

For the selection of cultivators the farm families were listed in each village and were classified in three group.

1. Small farmers with land holding from 1 to 1.99 hectares.
2. Large farmers with land holding with 2 hectares and above.
3. Large farmers with land holding with 3 hectares and above.

From all three groups 20 percent farmers were selected from each village with the help of systematic random sampling.

The distribution of cultivators in different size groups and villages has been presented in Table 2.

No. Name of Village	Below 1 ha T	S	1 - 1.99 T	S	22 above T	S	Total T	S
1. Badalgunj	23	4	30	6	11	2	64	12
2. Sarangapur	29	6	10	2	3	1	42	9
3. Palpur	32	6	7	2	2	0	41	8
4. Balipur	9	2	2	0	20	4	31	6
5. Chakapurkala	25	5	5	1	3	1	33	7
Total	118	23	54	11	39	8	211	42

T = Total
S = Selected.

Method of enquiry : Taking into consideration the convenience and economy the survey method was used for the collection of data. Selected cultivators were personally interviewed during the period of study.

Schedules:

For the collection of data only family schedules were used, the proforma of which has been given in appendix.

Period of enquiry:

Study was carried out during the agricultural session of 1974-75.

Method of analysis:

The tabular method was used for the analysis and interpretation of results.

Analysis of variance was used to find out the cost varieties.

Limitations of the Study :

1. Cultivators used to hesitate in telling the fact due to illiteracy and ignorance.
2. They were not interested to give his actual condition due to social restrictions.
3. Cultivators could not give his correct information due to weak memory.

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CHAPTER IV

RESULTS AND DISCUSSION

Structure of Farm Families

Table IV.1

Size Group (hectares)	Average size of family	Percentage of		Percentage in age group		
		Male	Female	0-14	15-59	60 years & above
I	6.26	55.85	44.15	48.43	47.65	3.82
II	6.00	55.11	44.89	48.14	44.25	7.61
III	6.40	53.64	46.36	47.91	41.14	10.95
Sample average	6.22	54.96	45.12	48.39	45.05	6.60

Here it shows the distribution of family members according to size group. It also whows different age-groups of members in each size group. There is not much difference in the family size, all the three size groups are having almost equal average size of family. Males are more than females in all size groups and age group between 15 to 59 accounts for more than fortyfive percent which is the productive group.

Table IV.2

Literacy of sample farmers

Size group	Average size of family	Primary School	Medium School	High School	Percentage of Literacy
I	6.26	28.90	13.69	7.03	50.40
II	6.00	25.86	18.48	3.44	48.92
III	6.40	26.06	16.14	6.24	50.46
Sample average	6.22	27.17	17.36	5.78	50.27

Table IV.2 shows the propórtion of literacy and illiteracy among different size groups of sample farmers. As the size of holding increases, the literacy percentage also increases with the exception of size group II. That is more educated and higher educated proportion as more in the III size group.

Table IV. 3

Occupational Distribution of sample farmers

Size Group	Percentage of farmers having	
	One Occupation	Two Occupations
I	87.81	12.69
II	93.10	6.90
III	83.30	16.67
Sample average	88.00	12.00

The table indicates that the percentage of farmers having more than one occupation falls in the size group of I and III than the size group II, That is in the case of size group II less number of farmers are having two occupations than the size group I and III.

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Table IV.4

Land utilisation of sample farmers.

Size Group	Average sizef of Holding	Average no. of fragments	Area in hectares			Intensity of Cropping
			Net area sown	Double cropped area	Gross sown area	
I	0.76	5.19	0.76	0.58	1.34	176.40
II	1.55	4.89	1.55	0.84	2.39	154.50
III	4.09	9.66	4.09	3.20	7.29	178.20
Sample Average	1.98	6.45	1.98	1.45	3.43	173.20

Table IV.4 shows the extent of utilisation of land by different sample farmers among different size groups, land utilisation is an important factor in improving the efficiency of farm business, as it is a limited resource. The average size of holding second size group is more than double than the first size group and same is the case between second and third size group. The number of fragments are increasing along with the increase in the size of holding. Intensity of cropping was highest in third size group. Here it shows less intensity of cropping for second size group than first size group.

Table IV.5

Source-wise distribution of irrigated area of sample farmers

Size Group	Well	Tubewell	Canal	Percentage of irrigated area
I	0.23(35.71)	0.15(9.50)	0.04(9.53)	55.27
II	0.34(49.27)	0.25 (36.23)	0.10(14.50)	44.51
III	1.65(53.50)	0.37(16.97)	0.16(0.16)	53.30
Sample average	1.98(51.00)	0.24(17.42)	0.08 (2.18)	

The above table shows the source-wise distribution of irrigated area. Intensity of cropping has direct bearing on the irrigation facilities. Crop production is dependent on the irrigation facilities. It can be seen from the table that the well irrigation is the main source for most of the area of sample farmers followed by tubewell irrigation which is having lesser area. In third size group more than fifty percent of area under well irrigation. Tubewell occupies second place and having more or less same in comparison to canal.

Table IV.6

Cropping Pattern

Crops	Size-group in hectares					
	I		II		III	
	Av.	Per.	Av.	Per	Av.	Per
Kharif						
Paddy	0.31	23.30	0.62	25.94	1.51	20.52
Bajra	0.21	15.79	0.30	12.42	1.19	16.17
Jowar	0.08	6.24	0.23	12.12	0.73	9.69
Arhar	0.12	9.19	0.23	12.12	0.51	6.93

Table IV.6 continued

	I		II		III	
	Av.	Per	Av.	Per	Av.	Per
Rabi						
Wheat	0.46	34.50	0.78	32.65	2.40	29.07
Pea	0.11	8.27	0.15	6.27	0.49	6.67
Gram.	0.03	2.25	0.12	1.02	0.48	6.52

Av. = Average

Per = Percentage

Table IV.6 shows the preference of sample for various crops with available resources. This table also reveals that more than one-third of cultivated area is occupied by wheat . Next comes paddy which occupy about one sixth of cultivated area.

Table IV.7

Cost of cultivation of high yielding and Desi varieties of paddy. (Per Hectare)

Items	H.Y.V.		Desi Variety	
	Amount	Percentage	Amount	Percentag
1. Labour				
(a) Family	349.20	25.79	252.00	29.92
(b) Hired	232.80	19.73	108.00	12.82
2. Bullock	222.00	17.97	132.00	15.67
3. Seed	60.00	4.15	30.00	3.56
4. Manure	60.00	4.15	75.00	8.97
5. Fertilizers	110.00	7.90	-	-
6. Insecticides	25.00	1.47	-	-
7. Invest on working capital	19.00	0.84	16.00	1.90
8. Depreciation	18.00	0.74	18.00	2.13
9. Land Revenue	8.00	0.16	8.00	0.95
10. Rental value of owned land	200.00	15.20	200.00	23.75
11. Interest on fixed capital	8.00	0.16	8.00	0.95
Total Cost	1312.00	100.00	852.00	100.00

It can be seen from Table IV.7 that 25 percent of the cost was incurred for family labour in high yieldig and 30 percent for local varieties.

This may be because the farmers having smaller holdings were growing desi varieties and they could not spend much on hired labour and most of the labour was contributed from family itself.

More than 50 percent of the cost accounted for labour (bullock, hired and family) in all the cases. If we see the fertilizer percentage, it was nearly 8 percent in high yielding varieties and no fertilizer in desi with traditional practice because only poor and small farmers who could not afford to use fertilizer application were growing desi varieties. Other fixed items remain same for all the varieties.

Table IV. 8

Cost of cultivation per hectare for High Yielding Varieties of paddy

Items	Varieties					
	Padma		IR - 8		TN - 1	
	Amount	Percentage	Amount	Percentage	Amount	Percentage
1. Labour						
(a) Family	320.50	20.36	310.50	23.27	295.00	20.64
(b) Hired	390.50	24.84	305.50	21.92	305.00	21.04
2. Bullock	225.00	14.29	185.00	12.26	205.00	14.34
3. Seed	80.00	5.08	75.00	5.38	90.00	6.30
4. Manure	50.00	3.18	50.00	3.59	50.00	3.50
5. Fertilisers	210.00	13.34	175.00	12.56	190.00	13.00
6. Insecticides	45.00	2.85	40.00	2 .87	40.00	2.81
7. Interest on working capital	19.00	1.21	19.00	1.36	19.00	1.30
8. Depreciation	18.00	1.15	18.00	1.29	18.00	1.25
9. Land revenue	8.00	0.51	8.00	0.57	8.00	0.56
10. Rental value of owned land	200.00	12.71	200.00	14.36	200.00	14.00
11. Interest On fixed capital	8.00	0.51	8.00	0.57	8.00	1.26
Total	1574.00	100.00	1393.00	100.00	1428.00	100.00

The cost of cultivation per hectare for different H.Y.Varieties of paddy is shown in the above table. The family labour cost was highest in case of Padma, followed by I.R.8 and T.N. - 1. Hired labour is also highest in case of Padma but same in case of I.R. 8 and T.N.-1. Bullock, fertilizer and insecticyde are also having the highest cost for Padma than I.R-8 and T.N. - 1. Depreciation, land revenue, rental value of owned land, interest on working capital are the same for all the three varieties.

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Table IV.9

Pattern of Resources use per hectare for H.Y.V. and Desi varieties.

Resources	H.Y.V.		Desi	
	Aty.	Value	Qty.	Value
1. Labour				
Family (MD)	84 days	349.20	63 days	252.00
Hired (MD)	58 "	232.80	27 "	108.00
2. Bullock	31 "	222.00	18 "	132.00
3. Seed	30 Kg.	60.00	30 Kg.	30.00
4. Manure	150 Kg.	60.00	200 Kg.	75.00
5. Fertilizers	55 Kg.	110.00	-	-
6. Chemicals	½ Kg.	25.00	-	-
7. Interest on working capital	-	19.00	-	16.00
8. Depreciation	-	18.00	-	18.00
9. Rental value of owned land	-	200.00 -	- -	200.00 -
10. Land revenue	-	8.00	-	8.00
11. Interest on fixed capital	-	8.00	-	8.00
Total cost		1312.00		852.00

The above table shows the pattern of resource uses per hectare for H.Y.V. and desi variety. Man days required in case of H.Y.V. are higher than that of Desi varieties. In that hired labour are having considerable difference with H.Y.V. than with local varieties. In case of seeds and manure, the total input is more or less the same. Other fixed costs are same both in H.Y.V. and Desi varieties.

Table IV. 10

Pattern of resources use of H.Y.V. according to different varieties.

	Padma V_1		I.R 8 V_2		T.N.- 1 V_3	
Resources	Qty.	Value	Qty.	Value	Qty.	Value
1. Labour						
Family	80 days	320.50	70	310.50	70	295.00
Hired	100 "	390.50	73	305.50	73	305.00
2. Bullock	30	225.00	26	185.00	28	205.00
3. Seed	40 Kg.	80.00	37	75.00	45	90.00
4. Manure	166 Kg	50.00	166 Kg	50.00	166Kg	50.00
5. Fertilisers	105 Kg	210.60	87 "	175.00	95"	190.00
6. Chemicals	½ "	45.00	½ "	40.00	½"	40.00
7. Interest on working capital	-	19.00	-	19.00	-	19.00
8. Depreciation	-	18.00	-	18.00	-	18.00
9. Land revenue	-	8.00	-	8.00	-	8.00
10. Rental value of owned land	-	200.00	-	200.00	-	200.00
11. Interest on fixed capital	-	8.00	-	8.00	-	8.00
Total		1574.00		1393.00		1428.00

The above table reveals a comparative study of costs and input requirement of different varieties of high yielding that is Padma, I.R 8, T.N - 1. The highest family labour needed in case of Padma I.R-8 and T.N. - 1 are having the same family labour requirement. Hires labour also giving the similar type of results. In case of bullock labour the highest was Padma followed by T.N - 1 and I.R-8.

Seeds needed maximum for T.N. -1 followed by Padma and I.R -8 Manure requirement was same for all the three varieties. Fertilizer requirement was the highest for Padma followed by T.N. - 1 and I.R - 8. Chemicals are all the same for all the three varieties. Fixed costs remain the same for all the three varieties.

Table IV.11

Cost of Cultivation per Hectare for local varieties of paddy

Items	N-22		Rambhog	
	Amount	Percentage	Amount	Percentage
1. Labour				
(a) Family	320.50	26.21	335.00	32.83
(b) Hired	195.00	15.93	70.50	6.80
2. Bullock	200.00	16.34	185.00	18.07
3. Seed	60.00	4.92	55.00	5.37
4. Manure	75.00	6.12	80.00	7.82
5. Fertilisers	105.00	8.58	40.00	3.91
6. Chemicals	15.00	1.23	5.00	0.45
7. Interest on working capital	19.00	1.55	19.00	1.85
8. Depreciation	18.00	1.47	18.00	1.76
9. Land revenue	8.00	0.65	8.00	0.78
10. Rental value of owned land	200.00	16.35	200.00	19.54
11. Interest on fixed capital	8.00	0.65	8.00	0.78
Total	1223.50	100.00	1023.50	100.00

From the table IV.10and IV.11. the cost of cultivation of different varieties under high yielding as well as desi varieties can be seen. The cost of cultivation of Padma, a high yielding variety was highest and cost of cultivation of

Rambhog a local variety, was lowest. Since high yielding varieties need considerable amount of fertilizer and lot of care regarding pest attack etc. its cost was more. But Desi varieties were mostly cultivated by small and medium size farmers as they could not spend much on fertilizers.

Table IV. 10 gives total output, net profit and input-output ratio for different varieties. The input - output net profit and input - output ratio are more for the high yielding varieties. The net profit of high yielding varieties is double than the desi. In case of input - output ratio there is difference between high yielding and desi having somewhat less input-output ratio.

Table IV.12

Crop-cum-variety-wise yield, Net profit and Input-output ratio on sample farms.

ety	Yield(qts)		Value		Total Output Rs	Total Input Rs	Net Profit Rs	Input Output ratio
	Grain	Straw	Grain	Straw				
h lding	30	60	1950	240	2190	1312.00	878.00	1.10
l	12	36	780	288	1068.00	832.00	216.00	1.49
h Yielding								
Padma	40	70	2600	320	2920	1574.00	1346.00	1.90
T.N.-1	30	40	1950	240	2190	1428.00	762.00	1.50
T.R.-8	28	56	1820	224	2044	1393.00	651.00	1.46
al Variety								
N-22	20	40	1300	320	1620	1223.50	396.50	1.34
Rambhog	14	42	910	336	1246	1023.50	222.50	1.21

Further, it is clear that Padma is getting maximum net profit which is nearly twice that of IR 8 and T.N. - 1. it is 4½ times more than N - 22 and nearly seven times more than the Rambhog variety. This shows that even though there is not much difference in the cost of cultivation between Padma and other high yielding varieties, Padma gives maximum yield that means Padma is more suitable to that set of conditions and respond well to the fertilizers.

The value of straw for local varieties is more than high yielding that means they produce more straw at the cost of grains. Their input-output ratio is also lesser than that of high yielding varieties.

Table IV.13

First Size Group

Particulars	High Yielding Variety		
	T.N - 1	I.R - 8	Padma
1. Human labour			
(a) Family	380.81	388.22	360.23
(b) Hired	191.22	200.34	210.11
2. Bullock	141.50	150.12	145.10
3. Seed	80.32	88.14	82.22
4. Manure	70.30	50.21	56.81
5. Fertilizer	154.72	172.40	179.86
6 Insecticides	-	-	-
7. Irrigation	20.22	30.00	35.76
8. Interest on working capital	23.44	23.83	20.80
9. Land revenue	42.22	40.28	37.82
10. Total depreciation	32.58	40.81	59.82
11. Rent paid for leased in land	-	-	-
12. Rental value of owned land	106.13	142.22	210.12
13. Interest on fixed capital	56.40	66.11	71.86
Total	1400.86	1390.75	1500.60

The above table shows that the expenditure is maximum in case of Padma variety under first size group followed by T.N. -1 and I.R- 8. Item wise expenditure of different varieties can be interpreted as the human labour was highest in Padma than I.R - 8 and T.N.- 1. Similar is the case for irrigation and fertilizer for Padma. Cost of seed and bullock labour was highest in case of I.R - 8 than

T.N - 1 and Padma. Rental value of owned land and interest on fixed capital is highest in Padma than I.R - 8 and T.N. - 1.

Table IV. 14
Second Size Group

Particulars	High Yielding Paddy		
	T.N -1	I.R -8	Padma
1. Human labour			
(a) Family	198.92	176.90	178.82
(b) Hired	240.20	209.72	304.99
2. Bullock	176.12	171.24	222.86
3. Seed	56.22	50.22	48.72
4. Manure	109.71	100.19	111.79
5. Fertilizer	195.76	206.20	245.22
6. Insecticide	-	-	-
7. Irrigation	20.80	36.30	56.20
8. Interest on working capital	29.18	30.24	40.69
9. Land revenue	39.41	52.64	53.40
10. Total depreciation	31.82	44.86	40.11
11. Rental paid for leased in land	-	-	-
12. Rental value of owned lalnd	110.89	130.72	170.86
13. Interest on fixed capital	60.72	65.88	64.65
Total	1325.75	1270.35	1590.45

The above table shows the cost analysis of different varieties of paddy under the size group II. The expenditure was highest in case of Padma followed by I.R. - 8 and T.N. - 1 as it was in case of under the first size group. Hired labour, bullock labour, manure, fertilizer and irrigation is maximum in Padma followed by T.N.- 1 and I.R.- 8. Family labour is costing highest in case of T.N-1 followed by I.R - 8 and then Padma.

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Table IV. 15

Third Size Group

Particulars	High Yielding Paddy		
	T.N - 1	I.R -8	Padma
1. Human Labour			
(a) Family	124.26	134.26	140.20
(b) Hired	320.21	340.41	360.41
2. Bullock	350.20	206.20	242.20
3. Seed	56.80	40.80	42.21
4. Manure	90.20	60.92	90.96
5. Fertilizer	145.20	180.21	266.22
6. Insecticide	27.28	30.12	36.27
7. Irrigation	11.80	22.20	17.85
8. Interest on working capital	21.84	21.05	23.44
9. Land revenue	49.20	46.51	49.21
10. Total depreciation	43.40	39.72	38.48
11. Rent paid leased in land	-	-	-
12. Rental value of owned land	112.96	120.61	141.22
13. Interest on fixed capital	76.31	69.70	74.68.
Total	1430.76	1300.23	1525.55

The above table shows the different costs of high yielding varieties of paddy under the third size group. The cost is maximum in case of Padma for inputs like Family and bullock labour, seed, manure, fertilizer, insecticide and irrigation followed by I.R - 8 and T.N - 1. The other fixed costs are more or less the same for other varieties.

ANALYSIS OF VARIANCE

Size Group

Varieties	S_1	S_2	S_3	Total
V_1 (T.N - 1)	1400.86	1325.75	1430.76	4157.37
V_2 (I.R - 8)	1390.75	1270.35	1300.23	3961.33
V_3 (Padma)	1500.60	1590.45	1525.55	4616.60
Total	4292.21	4186.55	4266.54	12735.30

$$C.F. = \frac{\text{Total}}{(\text{No. of treatment})^2} = \frac{(12735.30)^2}{9}$$

$$= \frac{162187866.09}{(\ 9} = 1802037$$

$S_1 = (4292.21)^2 = 18421264$

$S_2 = (4186.55)^2 = 17522596$

$S_3 = (4266.54)^2 = 18196756$

$T.S.S. = 74364637 - 1802087 = 72562550$

$(4157.37)^2 = 17280649$

$(3961.33)^2 = 15689521$

$(4616.60)^2 = 32418567$

$$S.S. \text{ of Variance} = \frac{(17280649 + 15689521 + 32418567)}{2} - C.F.$$

$$= \frac{65388737}{2} - 1802087$$

$$= 32694368 - 1802087$$

$$= 30892281$$

S.S. for error = T.S.S. — Varietal S.S. = 72562550 — 30892281

= 41670279

Sources of Variance	D.F.	S.S.	M.S.S.	Variance Ratio	F test at 5% and at 1%
Between varieties	2	30892281	1544614		
Within Error	2	41670279	20835139	.74	

Paired 't' test of local and H.Y.V.

Serial	1	2	3
H.Y.V.	1574	1393	1428
Local	1224	1024	1112
Deducting H.Y.V and Local Variety	350	369	316

$(350)^2 = 122500$

$(369)^2 = 136161$

$(316)^2 = 99856$

$\Sigma di^2 = 358517$

$\Sigma di = 1035$

$\bar{d} = \frac{1035}{3} = 345$

$$(s)^2 d = \frac{\Sigma di^2 - \left(\frac{\Sigma di)^2}{n}}{N - 1}$$

$$= \frac{358517 - 357075}{2} = 1442/2$$

$$= 721$$

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$$t = \frac{\bar{d}}{S.E.\ \bar{d}}$$

$$= \frac{\bar{d}}{S.D/\sqrt{n}}$$

$$= \frac{\bar{d}}{\sqrt{\frac{s^2\ d}{n}}}$$

$$= \frac{345}{\sqrt{\frac{721}{3}}}$$

$$= \frac{345}{\sqrt{240}}$$

$$= \frac{345}{15.16}$$

$$= 22.7$$

Explanation:

An analysis of variance is applied between different varieties of high yielding paddy under different size groups.

On analysis by F test at 5% and 1% level of significance, the variance ratio was noticed non-significant. That is the costs of producing different high uielding varieties of paddy i.e. T.N. 1, IR.-8, Padma were not much significant.

Again paired 't' test is applied between the local varieties of paddy and High Yielding Varieties of paddy. The result shown was significant. It reveals that the cost of production of high yielding varieties of paddy was considerably higher than local varieties of paddy.

CHAPTER V

SUMMARY AND CONCLUSION

Rice considered to be the staple food for majority of the population of India as well as world. Per quintal production in India is very low being 16.4 quintals per hectare although it occupies nearly 25 percent of the total cultivated area. We can increase the output not only by increasing the production but also by minimising the cost. The production can be increased by proper utilisation of resources which include land, labour, seed, manure and irrigation facilities. The optimum combination of these resources leads to maximum net profit.

Different authors tried to tackle the problem of cost of production and also tried to calculate the cost of production for different size group as well as for different varieties by which we can assess the better variety in each size-group of farmers. Blocks, villages and samples are selected either as randomly or purposively. We must decide the area in which the study is going on, then we must assess the different resources available. The authors tried to compare the cost of cultivation of local varieties of rice with high yielding varieties of rice. In all cases it shows that, even though the cost of cultivation of high yielding varieties is higher, it gives more marginal returns and the net profits are double than the local variety.

In this study, the main purpose is to compare the economics of cultivation of high yielding varieties with that of local varieties by assuming that high yielding varieties gives more profit than local varieties.

The selection of block is purposive and the selection of villages is by random sampling. The farmers were selected after stratifying them into different size groups. They were selected randomly from each strata.

For the collection of data, schedules were used by interviewing the farmer data was collected. Afterwards with the help of tabular method the data have been analysed.

Majority of the small farmers were cultivating local varieties whereas majority of medium and large farmers were cultivators of high yielding varieties i.e as the size of holding increases, the area under high yielding variety also increases.

The percentage of family labour is less in high yielding varieties and more in local varieties. Farmers using high yielding were using fertilizers, whereas, farmers of local varieties were using less fertilizer or not at all using fertilizers and same is the case with the use of chemicals.

With regard to particular varieties, cost of cultivation of Padma, a high yielding variety was the highest followed by T.N - 1, I.R. - 8, Rambhog, a local variety, was having minimum cost of cultivation followed by N.22 which was also a local variety.

As regards the bullock labour utilization in different varieties of paddy, it was noticed that high yielding varieties utilized more bullock labour than local varieties.

The input output ratio in local variety was less on large farms than small farms. Whereas input-output ratio in high yielding varieties were more on large farms than on small farms. Only large farmers were able to apply more inputs in the form of seeds, fertilizers, irrigation and pesticides.

Thus the profit table recommends that farmers
ng local varieties should grow high yielding variety.
rther indicates that large size group received
um.

The 'F' test indicates that the cost of produc-
of high yielding varieties of paddy is not signifi-
within the varieties although Padma costing the
st. So it can be concluded that growing any of
.Y.V. is feasible economically.

As far as 't' test (paired) concerned between
varieties of paddy and H.Y.V. of paddy, the result
significant. That is the cost of production of
. is considerably higher than local varieties of
. It was justified to produce H.Y.V. of paddy
se the production is considerably large in short
tion. Whereas in case of local varieties of paddy
ough the cost of production is less but the produc-
is considerably poor than H.Y.V. But it was
ified to grow H.Y.V. under the existing resources.

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The area under high yielding varieties should be increased.

The present rate of fertilizer application is very low. So farmers should follow the recommended doses.

The facilities for the supply of fertilisers should be improved.

Irrigation was as limiting factor for the adoption of high yielding varieties. Therefore the irrigation facilities should be increased.

Financial facilities were limited due to that. the inputs were not available.

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APPENDIX

STUDY ECONOMICS OF HIGH YIELDING VARIETIES OF PADDY OVER TRADIONAL VARIETY IN CHAKS BLOCK OF ALLAHABAD DISTRICT

QUESTIONNAIRE

me of the village ....

me of the head of the household ....

ste ....

imary Occupation? ....

econdary occupation and teritery occupation ....

at are the crops he grows? ....

w much area does he grow paddy? ....

ether he grows H.Y.V. or indigeneous variety..........

....

indigeneous variety, why not H.Y.V? ....

....

H.Y.V. why so? ....

at made him to grow H.Y.V.?..............................

at are the facilities does he got?.....................

oes he get any financial aid or not? If not why?......

....

Does he get irrigation facilities or not?..............

And other inputs if not why? ....

....

Whether he is interested to increase the area of H.Y.V.

if he gets more inputs if so why? ....

....

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What are the varieties does he grow? ....

....

Are the inputs very scared to practice H.Y.V.?......

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FARM MANAGEMENT PRACTICAL

PROFORMA FOR COLLECTION OF DATA FROM FARMERS

DENTIFICATION

Name of the Village:

Name of the head of the household:

Caste:

Occupation:

1.4.1 Primary occupation

1.4.2 Secondary occupation

1.4.3 Tertiery occupation:

ETAILS ABOUT CULTIVATOR AND HIS FAMILY

me	Relationship with the head	Sex	Age	Marital status	Literacy	Worker or non-worker	
						On the farm	Outside

AILS OF THE HOLDING:

1 Total land owned:

2 Total land rented out:

3 Total land rented in :

4 Total land cultivated:

5 Details of cultivated land:

a in t.	Kind of Tenure	Present value (₨)	Source of Irri-gation	Rent or revenue (₨)	Cropping scheme			Remark
					K	R	Z	

Plot wise yield of the crops

Crop	Area in Hectare	Yield		Yield per hecatre	
		Grain	Bhusa	Grain	Bhusa